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U. S. Department of Energy
Directorate of Administration
Office of Facility Planning and Support
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October 1980

U. S. Department of Energy Annual Report on Energy Management

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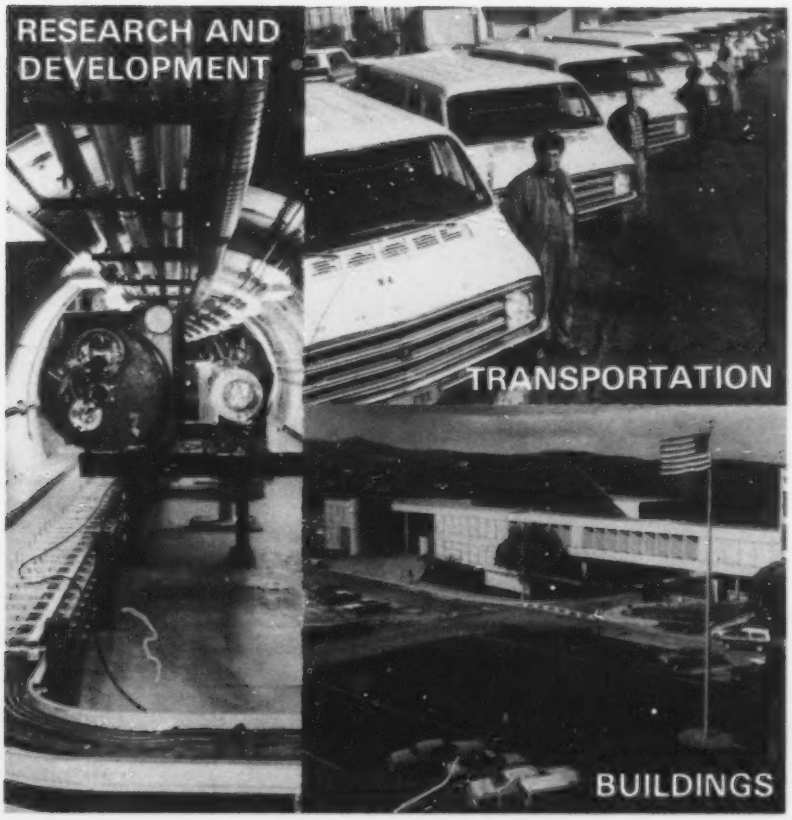

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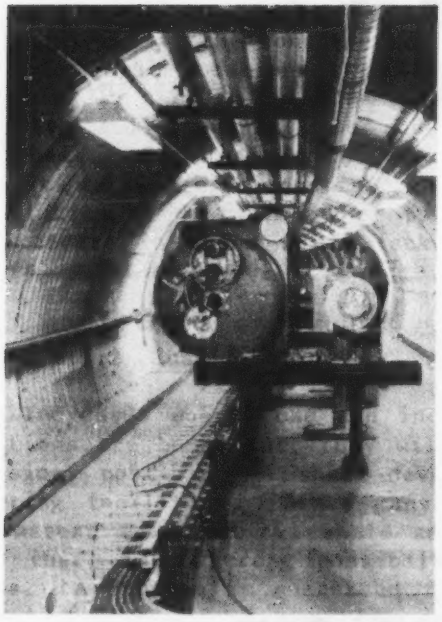
Prepared by:
Grumman Aerospace Corporation
Bethpage New York, 11714
Under Contract No. AC02-76CH00016

ENERGY MANAGEMENT IN TRANSPORTATION

The DOE plant in Rocky Flats, Colorado has a successful vanpooling program consisting of 16 vans, transporting over 200 employees.



ENERGY MANAGEMENT IN RESEARCH AND DEVELOPMENT

The first test cell facility for the Intersecting Storage Accelerator (Isabelle), Brookhaven National Laboratory, New York is insulated on the outside with 2-1/2 inches of polyurethane spray-on insulation equal to R-20. Isabelle is a 400 X 400 intersecting GEV storage accelerator system for ultra high energy physics experimentation, which will use cryogenically cooled superconducting magnets for greater energy efficiency.

ENERGY MANAGEMENT IN BUILDINGS

A number of energy conservation features were employed in the National Security and Resources Study Center at Los Alamos Scientific Laboratory, Los Alamos, N.M., including an active solar system used for heating and cooling the building, heat recovery from the building luminaires and from the exhaust air to heat air returning to the heating system, and storage for both hot and chilled water.

CONTENTS

Section		Page
1	EXECUTIVE SUMMARY	1
	Mission	1
	Management	1
	Programs	1
	Accomplishments	1
	Total Energy Consumption	1
	Petroleum Consumption	1
	Renewable Energy Sources	2
	Employee Awareness and Ridesharing Efforts	2
	Conclusion	2
2	INTRODUCTION	3
	Mission	3
	In-house Energy Management Program	3
	Accomplishments	3
3	BUILDINGS AND FACILITIES PROGRAM	5
	Introduction	5
	Program Elements	5
	Operations and Maintenance	5
	Energy Surveys	6
	Building Retrofit Projects	6
	Fuel Conversion Program	7
	New Building Programs	8
	Alternate Energy	8
	Progress Towards Goals	10
4	GENERAL OPERATIONS PROGRAM	11
	Program Objectives	11
	Transportation	11
	Vehicle Acquisition	11
	Alternate Vehicle Fuels	11
	Driver Training	12
	Experimental and Production Processes	12
	Metering	12
5	RELATED PROGRAMS	13
	Employee Awareness Programs	13
	Ridesharing/Vanpooling Programs	13
	Solar in Federal Building Program	17
	Photovoltaic Demonstration Program	17
	Electric and Hybrid Vehicle Demonstrations	17

CONTENTS (cont)

Section		Page
6	SUMMARY	19
	Significant Achievements	19
	Budget Initiatives	19
	Data Summary	19
APPENDIX		
	FEDERAL ENERGY MANAGEMENT PROGRAM INPUT DATA FORMS	A-i

1 – EXECUTIVE SUMMARY

MISSION

The Department of Energy (DOE) provides the framework for a comprehensive and balanced National energy program through the coordination and administration of the energy functions of the Federal Government. In support of its overall mission, DOE is responsible for energy management of 7,335 buildings in the Department's own facilities which occupy over 95.5 million square feet at over 90 sites throughout the country. These facilities are largely operated by contractor personnel.

MANAGEMENT

DOE's In-house Energy Management Program, designed to reduce energy consumption and increase energy efficiency in all of its facilities and operations, is developed and managed by the In-house Energy Management Division of the Office of Facility Planning and Support. This Office is under the Director of Administration. The Under Secretary is responsible for energy conservation within DOE.

PROGRAMS

The Department's energy management efforts are divided between two major programs, the buildings and facilities program and the general operations program. The buildings and facilities program effort is directed toward improving energy efficiency in the Department's building envelope energy consumption, whereas the general operations program is aimed at increased energy efficiency in process, production, research, vehicular, and other equipment energy usage. Generally, individual buildings and processes are not metered within DOE; however, a metering program is beginning in FY 1980 to obtain major process or operational energy separate from building energy consumption. Thus, currently, with the exception of vehicular equipment, the Department's energy consumption for buildings and operations is a single measurement. Detailed surveys of major experimental and production operations, as well as buildings energy consumption have been completed or are underway at DOE sites to identify ways of reducing buildings and process energy consumption. To date DOE has invested $51.4 million in retrofit projects.

ACCOMPLISHMENTS

Total Energy Consumption

The Department embarked on reducing its energy consumption in the early 1970s. Energy savings of 10.1 percent in BTU per gross square foot were achieved during the period from FY 1973 to FY 1975 primarily as a result of improving operations and maintenance of both buildings and production and research activities.

The Department's improvement in energy efficiency since FY 1975 has been accomplished by implementing additional operational changes, retrofit projects, fuel conversion projects, and by constructing energy efficient buildings and research equipment. During FY 1979 a total of 30 energy conservation projects were funded for $11.455 million. Energy savings of 1.09 trillion BTU and cost avoidance of $3.75 million are expected annually as a result of implementing these projects. This investment has helped to further reduce the Department's energy consumption per gross square foot by 3 percent in FY 1979, as compared to FY 1975, despite significant programmatic increases since FY 1975. These program increases are reflected in the increases in the Department's staffing, up 8 percent; and site funding, up 42 percent in real dollars.

More recently, for the period of April 1, 1979 to March 31, 1980, DOE reduced its overall energy consumption by 6.8 percent and gasoline consumption by 11.5 percent over the previous 12-month period. This was in response to the President's goal of 5 percent and 10 percent, respectively, for this period.

Petroleum Consumption

The Department is placing heavy emphasis on petroleum consumption reductions by a fuel conversion effort in major heating plants, as well as other energy conservation efforts. This has resulted in a current, April 1979 through

March 1980, 40 percent reduction in fuel oil consumption by the Department as compared to FY 1975. Additionally, DOE is utilizing alternate fuels in its vehicles in order to reduce petroleum consumption. Gasohol already satisfies 24 percent of all the Department's gasoline needs. Propane is also being used at several DOE sites to further reduce gasoline consumption. A Driver Energy Conservation Awareness Training (DECAT) Program is in operation at DOE's Nevada Operations Office and is contributing significantly to petroleum consumption reductions. Twenty-five DOE driver training instructors and 2,566 DOE and contractor vehicle drivers have completed this program. Eventually, all DOE drivers will be trained under this program. DOE is continuing to emphasize the purchase of fuel efficient vehicles. Vehicles purchased during FY 1979 and previous years have a combined average miles per gallon (MPG) which exceeds the design standards specified in Executive Order 12003.

Renewable Energy Sources

The demonstration of renewable energy sources in the Department's facilities is highlighted by the construction of demonstration solar projects for hot water and space heating. Ten projects have already been constructed and 18 additional solar projects are under design. Eighteen photovoltaic demonstration projects are also under design or construction in DOE facilities.

Employee Awareness and Ridesharing Efforts

The Department is heavily involved in employee awareness programs, as well as providing employees with ridesharing assistance. The Department has a formal Employee Awareness Program for all civil service and contractor employees. A variety of promotional techniques, spearheaded by DOE's in-house publication, "Energy Insider," are also used on a timely basis to disseminate information on energy conservation throughout DOE.

DOE has an active ridesharing program and vanpooling progam in operation at 13 sites, with over 200 vanpools serving over 2,500 employees. At the present time, 50 percent of DOE and contractor employees have ridesharing services available to them.

CONCLUSION

DOE's active program in energy conservation surveys and studies, retrofit projects, fuel conversion projects, operation and maintenance improvements, driver training, and employee awareness have enabled the Department to reduce its energy consumption in FY 1979 by 12.7 percent in BTU per gross square foot, as compared to the embargo year of 1973. These programs will be continued and augmented to achieve the DOE energy conservation goals.

2 – INTRODUCTION

MISSION

The Department of Energy (DOE) provides the framework for a comprehensive and balanced National energy plan through the coordination and administration of the energy functions of the Federal Government. The Department is responsible for the research, development, and demonstration of energy technology; the marketing of Federal power; energy conservation; the nuclear weapons program; regulation of energy production and use; pricing and allocation; and a central energy data collection and analysis program. Of primary concern to the Department are the promotion of consumer interests and the encouragement of competition in the energy industries, as well as the protection of the Nation's environment and the health and safety of its citizens.

In support of its overall mission, DOE manages over 7,000 buildings at over 90 sites throughout the country. These facilities occupy over 95 million square feet and, in FY 1979, consumed approximately 86 trillion BTU of energy at a cost of about $157 million. DOE also operates over 15,000 vehicles, including 1,640 special purpose vehicles and 1,995 GSA assigned vehicles, plus a variety of off-road construction and maintenance vehicular equipment. An additional 2.2 trillion BTU of energy was consumed in FY 1979 by vehicles and equipment.

IN-HOUSE ENERGY MANAGEMENT PROGRAM

To promote the efficient and economical use of energy at its facilities, DOE has implemented an In-house Energy Management Program designed to reduce energy consumption and increase energy efficiency in the buildings and general operations of all of its facilities. The Program is responsive to a number of Federal laws, regulations, and directives; and has as its major goals:

- Retrofit of all buildings to improve energy efficiency and assure minimum life cycle costs by 1990.
- Reduction, in existing DOE buildings by 20 percent and in new DOE buildings by 45 percent, of average energy use per gross square foot by FY 1985, as compared to FY 1975 usage.
- Reduction of petroleum-based fuels use by 30 percent by FY 1985, as compared to FY 1975 usage; and elimination of petroleum as a major energy source by FY 1995.
- Elimination of the use of natural gas as a major energy source by FY 1995.
- Implementation of cost effective solar and other renewable energy systems.
- Improvement in average vehicle fleet miles per gallon (MPG) by 10 percent in 1980.

DOE is working to achieve these goals by administering comprehensive energy conservation programs at all of its facilities, encompassing preliminary energy audits, technical surveys, improved operations and maintenance procedures, building retrofit projects, new building design, fuel conversion projects, transportation and vehicles, energy conservation awareness programs, and other energy conservation related programs.

ACCOMPLISHMENTS

DOE reduced its buildings and facilities energy consumption per gross square foot by 3 percent in FY 1979 as compared to FY 1975.

DOE achieved a 6.8 percent reduction in overall consumption and an 11.5 percent reduction in automotive fuels for the April 1979 through March 1980 period, exceeding the Presidential memorandum goals of 5 percent and 10 percent reductions. Fuel oil consumption at DOE facilities was reduced by 18 percent in FY 1979, as compared to FY 1975, and recent emphasis on petroleum fuels reduction shows DOE currently using 40 percent less fuel oil than in FY 1975.

3 - BUILDINGS AND FACILITIES PROGRAM

INTRODUCTION

A major effort of DOE's Energy Management Program is focused on its over 7,000 buildings and associated utilities and other facilities, which have a replacement value of more than $30 billion. DOE's structures include highly sophisticated research facilities, machine shop facilities, chemical processing plants, weapons fabrications facilities, and office buildings. They range from massive concrete structures with radiation-proof shielding to conventional structures, including temporary structures such as quonset buildings and mobile trailers. Most of these DOE buildings are between 10 and 35 years old. Because they were built during an era when energy was abundant and inexpensive, they present substantial opportunities for energy saving retrofit.

DOE expects to achieve 90 percent of its FY 1985 energy reduction goal through a program of extensive retrofit projects in its existing buildings. The remaining 10 percent will be met through a variety of operational and maintenance improvements in its buildings and through energy conservation awareness programs. The use of renewable energy sources is expected to be important in the long term, but is not expected to contribute significantly to achieving the FY 1985 goal.

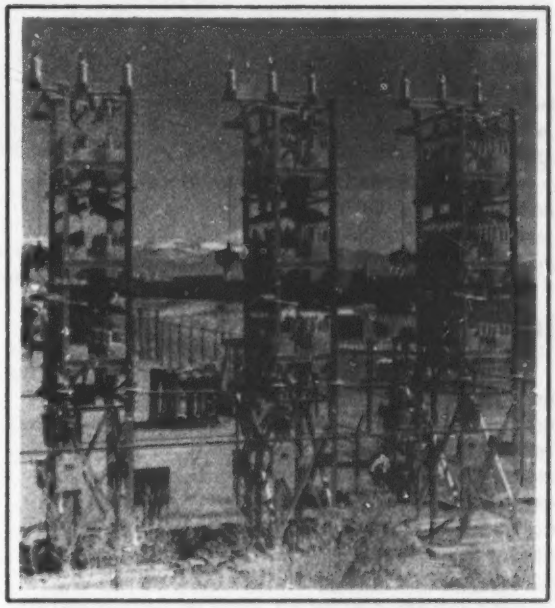
PROGRAM ELEMENTS

Reduction in energy usage at DOE facilities is being accomplished through improved operational and maintenance procedures, and implementing energy reducing retrofit projects in existing buildings based on the results of energy surveys. Reducing the use of depleting fuels is being accomplished by substituting coal and other alternative energy resources for natural gas and oil in central heating plants. The use of energy conservation oriented building standards and solar energy designs in new buildings help to minimize energy growth.

Operations and Maintenance

Heavy emphasis on operational and maintenance improvements accounted for most of the energy reduction in DOE's buildings and facilities during the early years of the program, and was the major contributor to a 10.1 percent energy use reduction in BTU per gross square foot at DOE facilities from FY 1973 to FY 1975. Conservation efforts in the operations and maintenance areas continue to focus on reduced lighting levels and the use of more efficient lighting components; thermostat setting limitations; increased attention to the adjustment and maintenance of heating and cooling equipment; energy conservation training programs for operations and maintenance personnel; and energy awareness programs for DOE and contractor employees.

These measures have been implemented primarily through the publication and use of energy conservation guidelines, how-to manuals, training programs for operating and administrative personnel, and employee awareness programs.



Installation of capacitors throughout the electrical system at DOE's Los Alamos site has resulted in reduction of transmission line losses. The capacitor banks are incrementally switched by remote supervisory control as the load requirements change. Energy savings for this project is estimated at 108 billion BTU annually.

DOE's Mound Facility at Miamisburg, Ohio, has replaced 77 single speed ventilation fan motors with two-speed motors with control timers. The new motors reduce ventilation rates during unoccupied periods. Annual energy savings is estimated to be 5.3 million kilowatt hours of electricity, 15 million cubic feet of natural gas and 13,000 gallons of fuel oil. This represents a total of 78.7 billion BTU in annual savings.

Energy Surveys

Preliminary energy audits of all DOE buildings larger than 1,000 square feet have been completed. A program of energy surveys was started at DOE facilities in 1977 to identify energy conservation retrofit projects. In-depth technical surveys have been completed for more than 50 percent of the most energy intensive DOE buildings, and will include all major DOE buildings by the end of FY 1982. Surveys completed by FY 1982 are expected to identify cost-effective retrofit projects to meet nine-tenths of DOE's 20 percent energy reduction goal by 1985. The survey program will continue beyond FY 1982 in order to meet the 1990 goal of improving the energy efficiency and minimizing life cycle costs of all buildings.

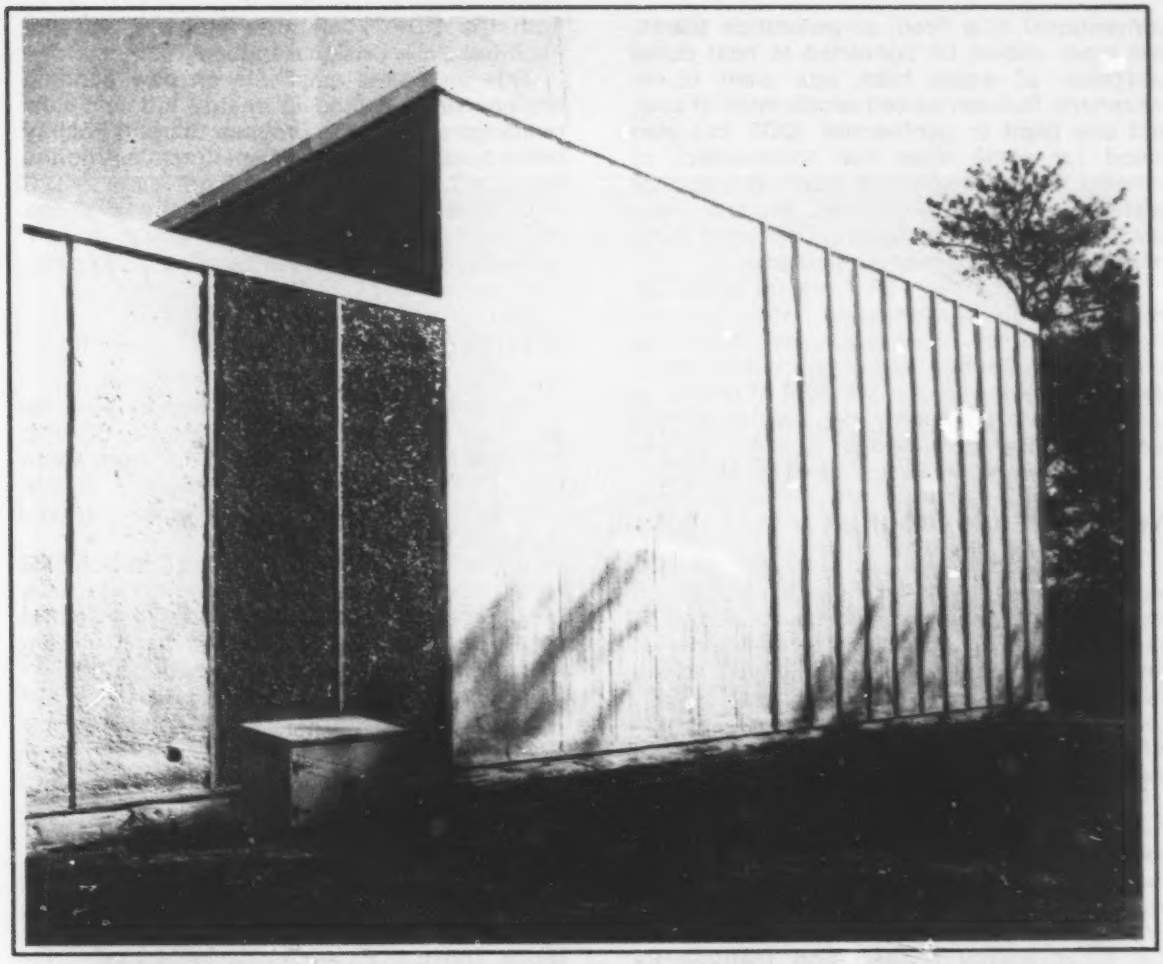
At Richland, Washington the vehicle maintenance shop is being retrofitted with the round high pressure sodium fixtures shown. The retrofit is shown at 50 percent completion to compare old and new lighting quality. The new sodium lights provide better lighting for half the electrical energy consumption.

Building Retrofit Projects

Retrofit energy conservation projects in existing DOE buildings are the major element in the Buildings and Facilities Program. The majority of projects at DOE facilities have fallen into 5 general categories:

- Energy monitoring and control systems.
- Heating, ventilating, and air conditioning systems modifications.
- Mechanical equipment and boiler modifications.
- Electric lighting and power improvements.
- Building insulation and storm windows improvements.

Modifying existing buildings to make them more energy efficient is expected to yield nine-tenths of the 1985 energy use reduction goal. DOE plans to invest $210 million in its retrofit programs by 1983 to meet the 1985 goal. Accumulated energy savings from retrofit projects are expected to exceed 12 million barrels of oil equivalent by the end of 1985. Funding of retrofit projects was started in FY 1977, and a total of 228 projects have been funded through FY 1980 at an investment cost of $51.4 million. In FY 1979, $11.46 million was invested in 30



This masonry block wall facility at Brookhaven National Laboratory was covered with two inch thick polyurethane insulation. Several different kinds of finish, small stone, stucco, redwood strips and coloring were applied to determine the most economical way of insulating the wall, and also be aesthetically pleasing. Annual source energy savings is 0.5 billion BTU.

retrofit projects which are expected to yield annual energy savings of 1.09 trillion BTU and an annual cost savings of $3.75 million (in FY 1979 dollars).

Fuel Conversion Program

DOE started an aggressive fuel conversion program shortly after the oil embargo of 1973, which has contributed substantially to the 18 percent reduction in fuel oil use realized from FY 1975 to FY 1979 and the 40 percent reduction in current (April 1979 through March 1980) fuel oil use as compared to the FY 1975 consumption. DOE's plan is to eliminate the use of fuel oil and natural gas as primary energy sources in all major fuel burning installations by converting to coal or other non-critical energy resources.

Major fuel burning plants at 5 DOE sites have been converted to use coal as a primary energy source at a cost of about $55 million from FY 1973 through FY 1979. Two additional central fuel burning plants will be converted in FY 1980 at a cost of $6.6 million.

Central plant studies have been completed or are underway for 7 additional DOE installations at a cost of about $1.4 million. Another 3 studies are planned at a cost of about $0.5 million, which will complete the investigation of all major DOE fuel burning installations.

The completed studies indicate that 4 major fuel burning plants should be converted to

conventional coal fired, co-generation plants; one plant should be converted to heat pump utilization of waste heat; one plant to atmospheric fluidization bed combustion of coal; and one plant to geothermal. (DOE has also found for some sites that replacement of existing energy inefficient steam distribution systems with energy efficient medium temperature hot water distribution systems is an attractive energy conservation measure.)

More than 1 trillion BTU will be saved annually through co-generation, while the implementation of new regulatory incentives contained in Section 210 of the Public Utility Regulatory Policies Act of 1978 (PURPA) is expected to significantly reduce the current estimated 10-year payback period for fuel conversion projects that include cogeneration.

New Buildings Program

To maximize the energy efficiency of DOE structures and meet the President's goal of improving energy efficiency in new buildings by 45 percent by FY 1985, as compared to existing similar structures, the Department issued strengthened energy design criteria in 1977. These criteria delineate minimum thermal efficiency standards which are more stringent than ASHRAE 90-75 and similar guidelines.

The criteria for energy conservation design includes specific requirements such as: computer aided dynamic analyses of alternative design concepts for energy consumption evaluation; a formal Energy Conservation Evaluation Report which must include a list of the major energy conservation features incorporated and the expected building performance in BTU per square foot per year; an analysis of solar and other renewable energy systems considered for use in the building; and metering plans. New construction projects are reviewed in the proposal phase to assure that energy conservation features are provided for in initial budget requests. Follow-up review assures that such features are incorporated in the design phase to assure minimum schedule and cost impacts.

To augment the design of energy efficient buildings at its facilities, DOE has developed a comprehensive computer simulation program for analyzing alternate energy conserving features in new building design. This program, DOE-2, is currently in use at many DOE sites. A Facilities Solar Design Handbook has also been developed by DOE and distributed to engineering personnel and operating contractors at the field installations. Workshops have been conducted for DOE engineers on both the DOE-2 computer program and the Facilities Solar Design Handbook.

This increased emphasis on new building designs has resulted in energy efficient new buildings such as the Program Support Facility being constructed at the Department's Argonne National Laboratory, that will consume 24,000 BTU per square foot annually, rather than the 200,000 BTU per square foot which is consumed by the typical office building of the past.

Alternate Energy

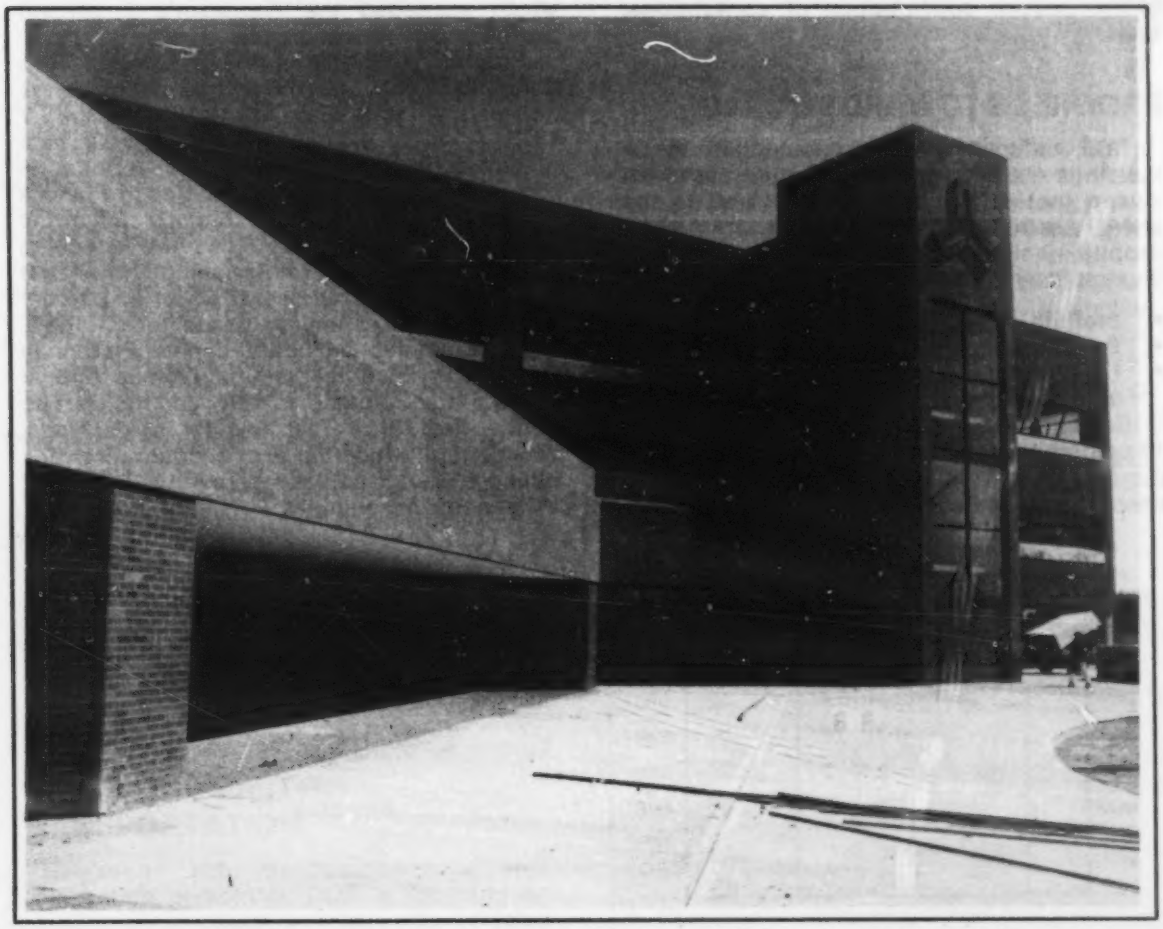
To conserve increasingly scarce and expensive imported fuel oil, a program to develop and utilize alternate liquid fuel (ALF) from waste combustible liquids was undertaken by DOE at the Brookhaven National Laboratory (BNL), Upton, N.Y., in 1977.

Since FY 1977, approximately 2.7 trillion BTU (18.0 million gallons) of waste derived ALF have been produced and consumed in the Central Steam Plant at the Brookhaven facility. Conservatively, this represents a savings of over $1.7 million. During FY 1979, 958 billion BTU of ALF was used at BNL, which represents a savings of approximately 530 billion BTU of conventional fuel oil worth over $690,000.

The waste liquids used in ALF have characteristics essentially similar to those of commercial ASTM fuel oils (grades No. 2, 4, 5, and 6), with which they are blended at a direct cost ranging from 17 to 29.3 cents per gallon, depending upon selected feedstocks and blend ratios. These ALFs are formulated by selective blending of waste feedstocks of recycled or previously used semi-miscible alcohols, mineral spirits, solvents, and other combustible liquids; with substandard but conventional fuel oils obtained from Government surplus or purchased in the spot market (e.g., Navy Special, Bunker "C", petroleum pipeline interfaces, etc.).

A study was also undertaken at BNL to evaluate the feasibility of constructing a facility to process municipal solid waste generated by the residents of the Brookhaven Township area. Combustible waste burned in the plant would be used to co-generate steam and electric power. BNL would purchase its steam requirements from this plant and the electric power generated would be purchased by the local utility. A similar waste fuel project is also being examined at the DOE Kansas City Plant.

A proposed project for Richland, Washington, would provide for a wood-fired boiler to burn scrap and diseased wood from



The new Idaho National Engineering Laboratory leased office building in Idaho Falls, Idaho is one of the most energy efficient structures in the country today. Designed as a model of energy efficiency, the building operates on less than one-fourth of the energy normally required for an office building of its size. The new facility utilizes a variety of energy saving concepts to lower energy consumption to less than 40,000 BTU per square foot per year. Conventional office buildings of this type consume 125,000 to 250,000 BTU per square foot per year. The design, construction, and completion of the Willow Creek Building represents a major commitment by the Department of Energy and its contractors to meet tomorrow's energy needs with today's technology in leased as well as Government owned property.

nearby National forests, saving 45,240 barrels of oil equivalent anually.

Additionally, the use of solar energy devices and technology is being considered in all major refurbishment programs and for all new facilities proposed for DOE's field sites, to further reduce consumption of conventional fuels.

PROGRESS TOWARDS GOALS

DOE reduced energy consumption in its buildings and facilities by 3 percent per gross square foot in FY 1979, as compared to the energy consumed per square foot in FY 1975, despite significant programmatic increases as illustrated by the following factors:

- Staffing + 8.0 percent
- Building Space + 4.0 percent
- Funding for Sites + 42.0 percent (in current dollars)

Consumption of fuel oil has been reduced by 18 percent for the FY 1975–FY 1979 period, and current (April 1979 through March 1980) consumption reflects a 40 percent reduction from the FY 1975 base year usage. This significant achievement is primarily due to fuel conversion projects.

For the period April 1979 through March 1980, DOE reduced buildings and facilities energy consumption by more than 6.6 percent, which exceeded the President's 5 percent overall energy reduction goal.

Programmatic related energy use increases during 1979 obscured the real impact of energy conservation efforts at DOE facilities since FY 1975. A prime example of the type of high energy consuming programmatic addition in this period is the Los Alamos Meson Physics Facility (LAMPF) at Los Alamos Scientific Laboratory in New Mexico. The LAMPF doubled the site's electric power consumption when it came on line, and represents about 1.5 percent of the total DOE energy usage for FY 1979. Other examples include the new Plutonium Processing Facilities at Los Alamos and at Rocky Flats, Colorado, in 1979; and the start-up of the Fast Flux Test Facility at Richland, Washington, which together account for over 1 trillion BTU, or about 1.1 percent of DOE's FY 1979 energy consumption.

4 - GENERAL OPERATIONS PROGRAM

The DOE General Operations Energy Management Program includes the management of process-type energy used by DOE facilities in the performance of their daily missions and functions. This includes energy used for general vehicle transportation, services, production or industrial type operations, research and development activities, and training programs. DOE operates extensive experimental and production processes, many of which are highly energy intensive, and uses a large number of vehicles due to the size and sprawling nature of its many facilities.

PROGRAM OBJECTIVES

The energy conservation objectives for the General Operations Energy Management Plan are to:

- Reduce vehicle and equipment energy consumption, particularly petroleum based fuels.
- Reduce process energy and increase process efficiency.
- Install metering systems for major energy using processes.
- Increase employees awareness of energy conservation.

TRANSPORTATION

To meet the transportation energy conservation objectives, DOE is focusing on acquiring more energy efficient new vehicles and using alcohol fuels in its vehicles. Emphasis is also being placed on driver energy conservation awareness training. The employee awareness program and the ridesharing/vanpooling programs are discussed under "RELATED PROGRAMS". As a result of these initiatives, DOE achieved an 11.5 percent reduction in automotive fuel consumption from April 1979 through March 1980, as compared to the previous 12-month period, which exceeded the President's 10 percent reduction goal.

Vehicle Acquisition

DOE increased its emphasis on purchasing fuel-efficient vehicles beginning in 1974. DOE's current program for acquiring fuel-efficient vehicles is being carried out in accordance with the Energy Policy and Conservation Act (EPCA) of 1975, which states that all passenger automobiles purchased or leased for 60 days or more must average 20 miles per gallon (MPG) during FY 1978, increasing to 27.5 MPG by 1985. Executive Order 12003 later expanded the program to include light trucks beginning in FY 1979, and increased the mileage goals for Federal passenger automobiles. The General Services Administration (GSA) is responsible for ensuring that Federal agencies meet the mileage goals, which DOE has exceeded through FY 1979 as shown in the following table.

	GSA MPG Goals			DOE New Vehicle MPG		
Fiscal Year	Passenger Vehicles	Light Trucks[A] 4x2	4x4	Passenger Vehicles	Light Trucks 4x2	4x4
1978	20	B	B	21.0	B	B
1979	22	17.2	15.8	23.5	19.4	18.0
1980	24	16.0	14.0			
1981	26	18.0	15.5			
1982	28	C	C			
1983	30	C	C			
1984	31	C	C			
1985	31.5	C	C			

A. Gross vehicle weight rating changes from 6,000 to 8,500 pounds in 1980
B. Program not in existence
C. Not yet determined by the Department of Transportation.

Alternate Vehicle Fuels

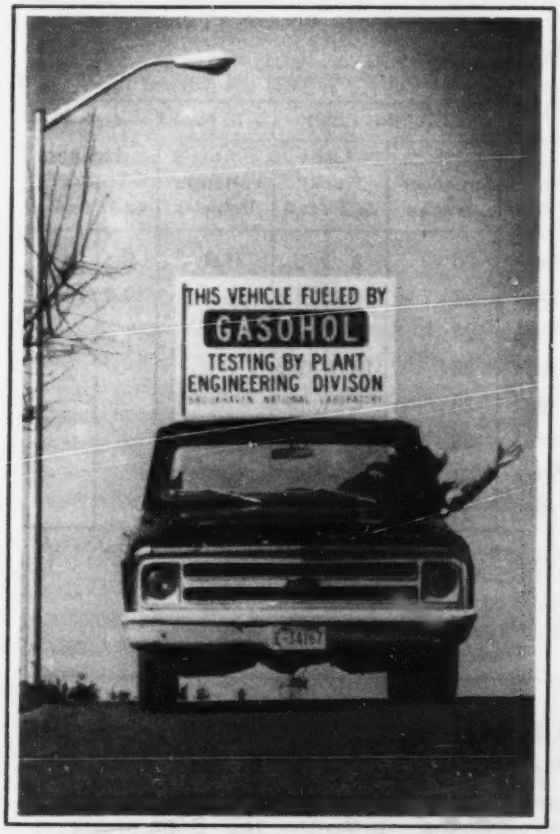
DOE is committed to the use of alternate fuels in its highway vehicles, including gasohol and propane. Currently, the Department is satisfying 24 percent of its total gasoline needs with gasohol, usually a mixture of 10 percent alcohol and 90 percent gasoline. Gasohol has been shown to be feasible for use in existing internal combustion engines. The DOE vehicle fleet began using alcohol fuels in FY 1979. Nine major sites are now using gasohol. All major

DOE sites having central gasoline filling facilities will utilize gasohol during FY 1980.

Propane is also being used in DOE vehicles at the Lawrence Berkeley Laboratory, the Paducah Gas Diffusion Plant, and the Idaho National Engineering Laboratory (INEL), and is planned for the Naval Petroleum Reserve sites where propane is produced as a by-product. INEL has converted over 150 pick-up trucks to propane, and expects to save 190,000 gallons of gasoline annually.

Driver Training

A Driver Energy Conservation Awareness Training (DECAT) Program has been initiated at DOE's Nevada Operations Office to train drivers of DOE vehicles to save energy. The program is being expanded to include all Federally licensed DOE vehicle operators and contractor personnel who operate Government motor vehicles in performance of DOE contracts. Thus far 2,566 DOE and operating contractor drivers and 25 DOE and 145 non-DOE driver training instructors have completed this program.



This Gasohol-burning truck, part of the Brookhaven Lab fleet, is being used on routine runs to determine whether gasohol (a mixture of leaded gas and methyl alcohol) is feasible for all Brookhaven vehicles. Earlier tests indicate gasohol burns cleaner than gasoline, may increase mileage, and in bulk purchase may cost slightly less than gasoline.

EXPERIMENTAL AND PRODUCTION PROCESSES

Many DOE facilities house energy-intensive experimental and production operations. DOE is studying ways to ensure energy-efficient operations in these facilities without adversely affecting research, development, and production goals.

Detailed engineering surveys of major processes have been completed or are underway at DOE sites. These surveys identify ways to reduce process energy consumption, and include economic analysis for those retrofit actions designed to save energy in industrial processes and facilities. No cost or low cost energy saving recommendations are implemented through procedural changes, or integrated into the routine operations and maintenance activity. Some energy-saving process modifications are already being implemented or considered, including:

- A project to recover waste heat from nuclear reactors at the Savannah River plant for use in a planned test facility to confirm operating and reliability specifications of newly developed equipment, such as heat pumps and electrical generators.
- A project to convert part of the accelerator system at the Fermi National Accelerator Laboratory to use cryogenically cooled magnets, which consume about 60 percent less energy than conventional large research magnets.
- Studies of the energy-saving potential and cost-effectiveness of waste heat recovery from uranium enrichment plants.
- Constructing a gas centrifuge enrichment plant at Portsmouth, Ohio, which would use substantially less energy to enrich uranium than the currently-used gaseous diffusion process.

METERING

In order to obtain a breakdown of process versus building energy consumption, the Department has established a metering program which began in FY 1980 with funding of about $540,000. Additional funding is planned for future years.

5 – RELATED PROGRAMS

In addition to the Buildings and Facilities and the General Operations Energy Management Programs, DOE is also involved in several energy conservation related programs designed to promote conservation, encourage more efficient use of available energy, and evaluate alternate energy applications.

EMPLOYEE AWARENESS PROGRAMS

As part of its In-house Energy Management Program, DOE has initiated an employee energy awareness program to promote energy conservation among its civil service and contractor employees. An informal awareness program was started shortly after the oil embargo of 1973. A variety of promotional techniques — newsletters, posters, films, lectures, seminars, stickers, and decals — have been used to disseminate information on energy conservation throughout DOE. A pilot employee awareness program was started at DOE's Germantown, Maryland, installation in May 1979, and was completed in September 1979. The DOE Energy Conservation Employee Awareness Program Handbook was issued subsequently to all DOE sites to augment the on-going program.

In late 1978, DOE surveyed energy conservation employee awareness programs existing at a variety of Government and nongovernment organizations. As a result of this survey, DOE developed guidelines for its own program. The resulting strategy for the DOE employee awareness program includes:

- Development of an overall plan, including objectives, strategies, and milestones.
- Development of an organizational approach.
- Use of a variety of media and promotional materials.
- Use of formally structured training programs.
- Use of several proven aproaches in the field of employee behavior, motivation, and marketing.
- Incorporation of a method to monitor the effectiveness of the various program elements and employee responses.

RIDESHARING/VANPOOLING PROGRAMS

To encourage gasoline conservation in private automobile use by its employees and contractor personnel, DOE has initiated a comprehensive employee commuter transportation program at each of its sites to promote increased use of mass transit facilities and the forming of ridesharing groups. A transportation coordinator has been designated for each DOE site to maintain current information concerning public transportation, and to provide ridematching services for carpools and vanpools. A ridesharing management workshop for DOE transportation

Stickers used at DOE sites to promote vanpools.

Saving energy gives us time to solve our energy problem.
1
We all have a consuming interest in energy
2
Think before wasting energy
3
Help DOE foot the energy bill.
(USE STAIRS, NOT THE ELEVATOR, WHEN GOING UP ONE FLOOR OR DOWN TWO.)
4
Be a blinding success:
5
You don't need money to invest in America's Future!
6
Have YOU saved some energy today?
BUS STOP
7
Even ideas don't work without energy...
THINK ABOUT IT!

* Pink Panther Posters Copyright 1979 U.A.C. Geoffrey. All rights reserved

Pink Panther posters used in DOE Employee Awareness Programs to promote energy conservation.

Pink Panther poster used in DOE Vanpool Program.

coordinators is being conducted by the Oak Ridge Associated Universities in Oak Ridge, Tennessee.

The Department has a formal vanpool program being initiated at each site. The program uses a variety of promotional material including: a set of three posters; bumper stickers; a general purpose poster to promote the program; and a handbook covering details of employer-sponsored, employee-owned, and third-party-owned-vanpools; as well as Federal law, state law, insurance issues, suggested costs, and operating procedures. Five individual brochures on vanpools and a short film entitled "We're Vanpooling" are available for distribution to all DOE and contractor employees.

A pilot vanpooling program for DOE employees in the Washington, D.C. area, called "Vanride," served as a model for DOE employee commuter programs nationwide. The ridesharing program distributes information on vanpooling, provides ride-match lists of employees, and helps coordinate the formation of vanpools.

Vanpooling programs have been started at 13 DOE sites with over 200 vanpools currently serving more than 2,500 employees. The programs at the Pantex Plant in Amarillo, Texas, with 37 vanpools, and at the Lawrence Livermore Laboratory in Livermore, California, with over 52 vanpools, have been particularly successful.

In addition to vanpooling programs, most DOE field offices have instituted carpooling programs. Over 50 percent of all DOE and contractor employees have ridematching services available to them under this program. The Mound Facility in Miamisburg, Ohio, has 448 carpools in operation under this program.

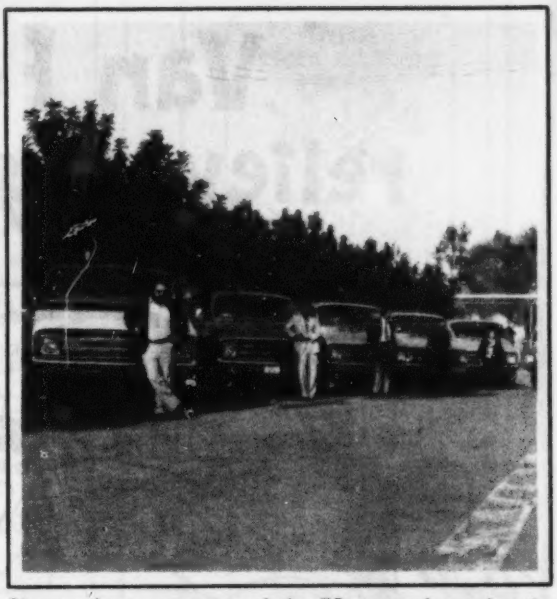
Ridematching services for buspools are also provided by the transportation coordinator at

each site if such service is not already available. Buspools, a relative unique concept for special locations where public transit is not meeting needs, are in operation at the Oak Ridge Gaseous Diffusion Plant. Eight employee-owned buses are serving some 300 plant workers, reducing the fuel consumed for commuting by these workers to about one gallon per person per week.

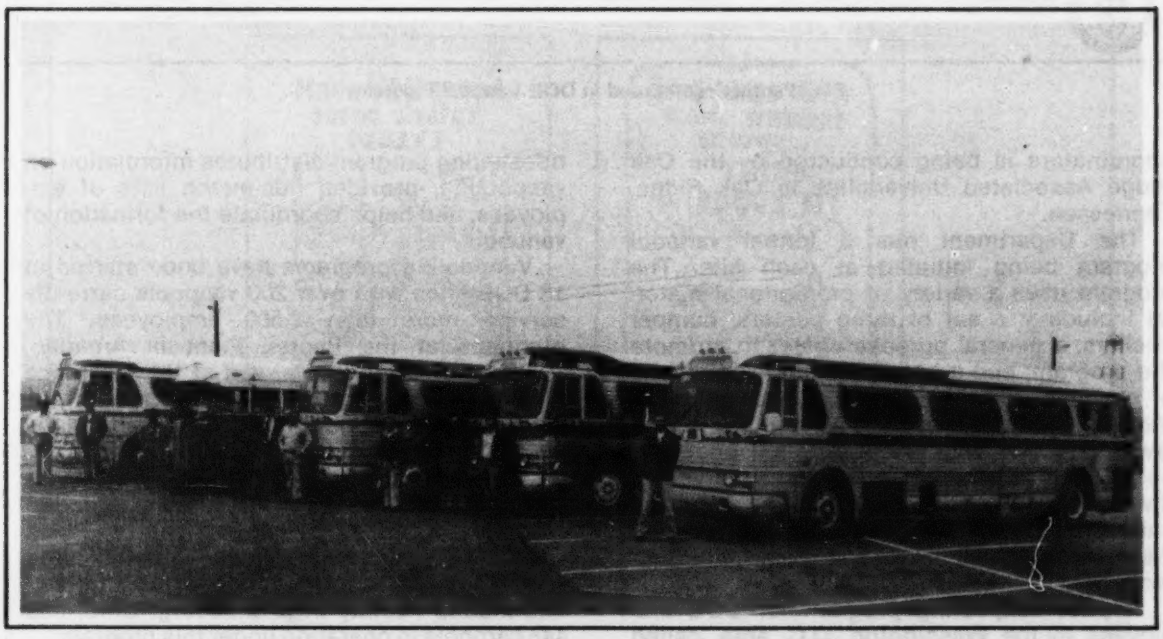
Assignment of parking spaces at DOE sites is made by giving priority to bus, van, and carpools over single-occupant vehicles. Additionally, under the new Federal parking policy, 2 of DOE major employment centers, the DOE Headquarters in Washington, D.C. and the Bonneville Power Administration Headquarters in Portland, Oregon, now charge employees for parking, thereby creating a further incentive for commuter efficiency.

DOE field organizations also are establishing individually-tailored programs to improve efficiency of vehicle use. Elements of these programs include:

- Improving utilization of taxi service to achieve more passenger miles without increasing fuel consumption.
- Using bicycles, motorized bicycles, or golf carts for on-site travel.
- Enforcing the speed limits on DOE sites.



Shown above are some of the 52 vanpools serving the 700 employees of the Lawrence Livermore Laboratory at Livermore, California.



Five of the 8 employee-owned buses now operating daily as part of the bus pool program at the Oak Ridge Gaseous Diffusion Plant.

SOLAR IN FEDERAL BUILDINGS PROGRAM

DOE is an active participant in the Federal Solar Heating and Cooling Demonstration Program, and has initiated 10 solar retrofit projects under the first phase of the program. These projects emphasize hot water and space heating, and have ranged in cost from $10,000 to $272,000, saving in excess of 2.0 billion BTU per year. Total investment is slightly over $1 million.

The FY 1980 Solar Federal Demonstration Program has approved 18 projects at DOE sites. These projects were funded at approximately $4 million, and will further demonstrate the use of active solar heating hot water and cooling and passive solar in DOE buildings.

PHOTOVOLTAIC DEMONSTRATION PROGRAM

Seventeen photovoltaic projects have been funded under Cycle II of the Federal Photovoltaic Utilization Program (FPUP) for approximately $140,000. One project for $448,000 has been approved under Cycle III of the FPUP program. A number of photovoltaic projects are already in operation, including seven solar operated railroad crossings in Richland, Washington. The photovoltaic collector array operates the railroad crossing gates and signals. The system has storage capability to operate the signals for more than 30 sunless days.

ELECTRIC AND HYBRID VEHICLE DEMONSTRATIONS

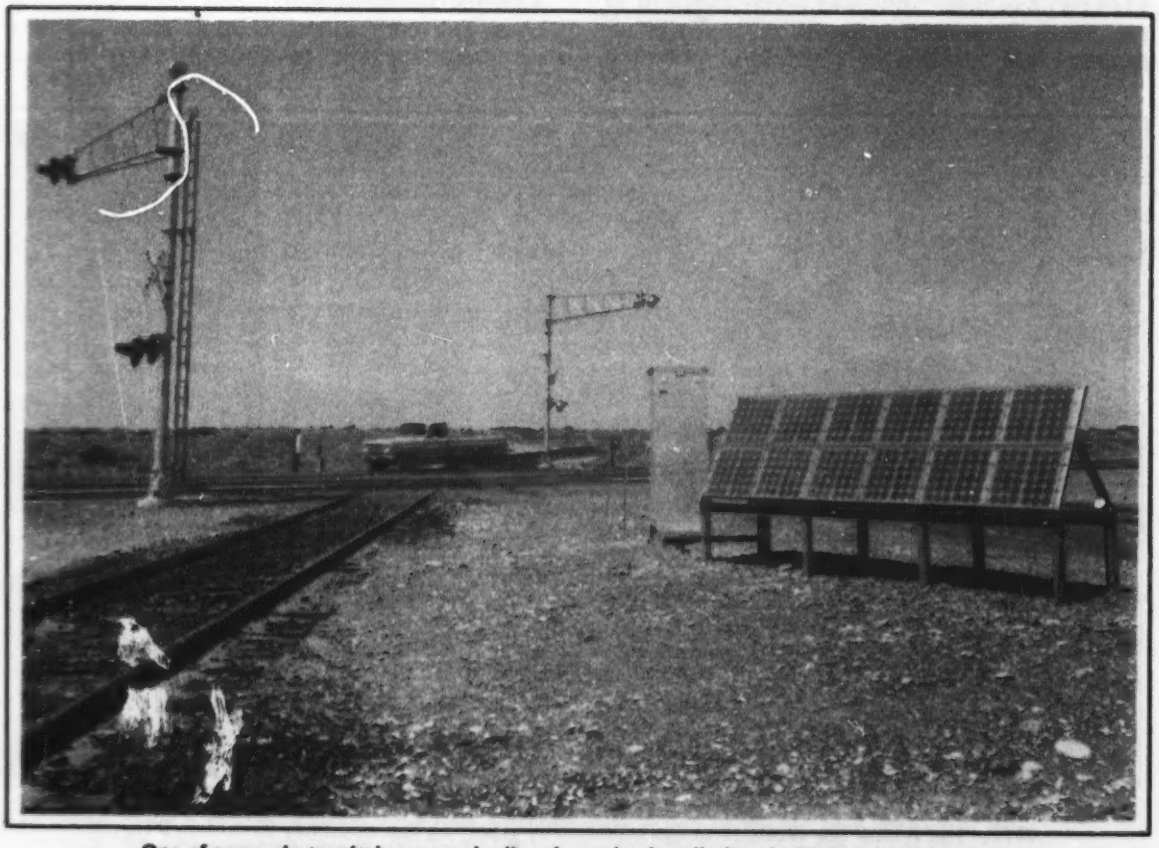
DOE is participating as a Federal fleet operator in the electric and hybrid vehicle demonstration program. This National program is authorized by the Electric and Hybrid Vehicle Research, Development and Demonstration Act of 1974. Five compact 4-passenger vans, now in use at the Oak Ridge National Laboratory, are undergoing a performance evaluation.

Brookhaven National Laboratory has received funding for the purchase of 13 electric vehicles. Body styles will include sedan-deliveries, small cargo vehicles, and full-size vans.

Idaho National Engineering Laboratory utilizes a variety of electrical vehicles and expects to receive 17 new battery-powered cars. The cars will replace existing gasoline-powered cars used for various site functions.

The Grand Junction Office installed this solar system on the cafeteria building, which was built in 1977. The system has exceeded design estimates by supplying approximately 90 million BTU per year, or more than 60 percent of the cafeteria's hot water and space heating.

A Department of Energy supplied electric van delivers mail to the Bonneville Power Administration Headquarters in Portland. The van is one of three being tested by BPA to determine efficiency, cost, and reliability. Based upon today's electricity rates it costs as little as $39 to power the van for 10,000 miles.



One of seven photovoltaic powered railroad crossing installations in Richland, Washington.

6 – SUMMARY

SIGNIFICANT ACHIEVEMENTS

DOE embarked on reducing energy consumption in buildings in the early 1970s by improving operations and maintenance. Identifiable energy savings of 10.1 percent in BTU per gross square foot were achieved during the period from FY 1973 to FY 1975 primarily as a result of these actions.

Since FY 1975, the Department has reduced its building energy consumption per gross square foot by 3 percent, through FY 1979, in the face of dramatic programmatic increases.

For the period April 1, 1979 to March 31, 1980, DOE reduced its overall energy consumption by 6.8 percent and automotive fuels by 11.5 percent over the previous 12-month period. This was in response to the President's goals of 5 percent and 10 percent, respectively.

Recent emphasis on fuel oil reductions via fuel conversion efforts and conservation have resulted in 40 percent reduction in fuel oil consumption currently as compared to FY 1975.

DOE is active in the demonstration of renewable energy resources as highlighted by the construction of 10 solar projects with an additional 18 projects under design.

In transportation, DOE is satisfying 24 percent of its total gasoline needs by the use of gasohol. To date, the Driver Energy Conservation Awareness Training (DECAT) Program has trained 2,566 drivers of DOE and contractor vehicles in addition to 25 DOE instructors and 145 non-DOE instructors.

DOE has developed and issued stringent new building design criteria, resulting in energy efficient designs highlighted by the Program Support Facility being constructed at the Argonne National Laboratory which will consume 24,000 BTU per square foot, annually.

BUDGET INITIATIVES

During FY 1979, a total of 30 energy conservation projects were funded at DOE facilities. This funding amounted to $11.455 million, and is expected to yield annual energy savings amounting to 1.09 trillion BTU, which represents annual energy cost avoidance equivalent to $3.75 million (in FY 1979 dollars). Savings from the projects funded in FY 1979 will not be fully realized until construction is completed in subsequent fiscal years.

A total of 73 energy retrofit projects are being funded in FY 1980 for $29.75 million. These projects are expected to yield annual energy savings of 2.4 trillion BTU, worth $5.9 million in cost avoidance.

DATA SUMMARY

The forms requested by the Federal Energy Management Program are included in the Appendix.

APPENDIX

Federal Energy Management Program
Input Data Forms

DEPARTMENT OF ENERGY
FEDERAL ENERGY
MANAGEMENT PROGRAM
SECTION 1 – FEDERAL AGENCY BUILDING
INVENTORY (MOST RECENT COMPLETED FY 79)

(A) Building Categories	(B) Buildings/Space By Category	
	(1) Total Number of Buildings	(2) Gross Square Feet (000's)
Hospitals	21	211.9
Prisons	0	0
Office Buildings	2,231	9,958.2
Schools	53	291.9
Other Institutional Buildings	115	1,090.6
Housing	373	593.4
Storage Buildings	1,279	12,218.7
Industrial Buildings	639	35,663.6
Service Buildings	1,023	10,722.4
Research & Development Building	886	19,352.4
Utility Buildings	360	2,117.0
All Other Buildings	355	3,287.4
Total (Optional)	7,335	95,507.5

DEPARTMENT OF ENERGY
FEDERAL ENERGY MANAGEMENT PROGRAMS
SECTION II.1 AGENCY PROGRESS TOWARD GOALS

(A) Areas of Inventory	(B) Federally Owned Existing Buildings		(C) Federal Owned New Buildings		(D) Leased Existing Buildings		(E) Leased New Buildings	
	(1) FY 75 Baseline	(2) Most Recent Completed	(1) FY 75 Baseline	(2) Most Recent Completed	(1) FY 75 Baseline	(2) Most Recent Completed	(1) FY 75 Baseline	(2) Most Recent Completed
		FY 79		FY		FY 79		FY
Number of Buildings	5,850*	6,245			1,020*	1,090		
Gross Square Feet (000's)	90,600*	94,045			1,400*	1,462		
Fuel Consumption Billion BTU	83,430*	84,094			1,297*	1,307		

*Estimated

Note: The 7,335 owned and leased buildings include over 2,400 trailers, of which an estimated 1,000 are leased. The gross square footage for owned and leased trailers and the fuel consumption for owned and leased buildings and trailers have been prorated.

SECTION II.2 AGENCY INVESTMENT AND SAVINGS

(A) Areas of Inestment	(B) Federally Owned Existing Buildings			(C) Federal Owned New Buildings			(D) Leased Existing Buildings			(E) Leased New Buildings		
	(1) Dollars Invested (000's)	(2) BTU's Saved (Billion)	(3) Dollars Saved (000's)	(1) Dollars Invested (000's)	(2) BTU's Saved (000's)	(3) Dollars Saved (000's)	(1) Dollars Invested (000's)	(2) BTU's Saved (000's)	(3) Dollars Saved (000's)	(1) Dollars Invested (000's)	(2) BTU's Saved (000's)	(3) Dollars Saved (000's)
Retrofit	11,455	1,090.8	3,753.4	0	0	0	0	0	0	0	0	0
Operation & Maintenance	1,680	169.5	1,463.0	–	–	–	–	–	–	–	–	–
Renewables & Solar	1,043	3.8	7.6	–	–	–	–	–	–	–	–	–
Other												
Total	14,178	1,264.1	5,224.0									

Note: During FY 1979 DOE invested in retrofit, operation and maintenance, and solar applications for owned existing buildings only. The projected energy and cost savings are those associated with the investments made in FY 1979. The operation and maintenance area includes the documented cost and savings achieved by Brookhaven National Laboratory's Alternate Liquid Fuels Program, and investments in employee awareness and vanpooling.

DEPARTMENT OF ENERGY
FEDERAL ENERGY MANAGEMENT PROGRAM
SECTION III – BUILDING ENERGY COST BY FUEL TYPE
(MOST RECENT COMPLETED FY 79)
(USE WHOLE DOLLARS IN THOUSANDS)

(A) Fuel Type	(B) Cost of Energy Consumption (000's)
Electricity	$ 100,796
Fuel Oil	$ 11,501
Natural Gas	$ 19,049
LPG or Propane	$ 402
Coal	$ 24,274
Purchased Steam	–
Other	$ 1,201
Total	$ 157,223

DEPARTMENT OF ENERGY

FEDERAL ENERGY MANAGEMENT PROGRAM

SECTION IV – GENERAL OPERATIONS ENERGY COST AND CONSUMPTION (MOST RECENT COMPLETED FY 79)

(A) Fuel Type	Functional Categories									
	(B) General Transportation		(C) Services		(D) Industrial or Production		(E) Training & Operational Readiness		(F) Other	
	(1) Billion BTU Fuel Consumption	(2) Dollars in (000's) Cost of Consumption	(1) Fuel Consumption	(2) Cost of Consumption	(1) Fuel Consumption	(2) Cost of Consumption	(1) Fuel Consumption	(2) Cost of Consumption	(1) Billion BTU Fuel Consumption	(2) Dollars in (000's) Cost of Consumption
Auto Gasoline*	1,409	8,996		*						
Diesel & Petroleum Distillate Fuels*	600	2,332								
LPG or Propane									19	76
Aviation Gasoline*									1	4
Jet Fuel*									209	722
Navy Special										
Other										
Total	2,009	11,382							229	802

*Coat Based on E.I.A. Avg 1979 Prices

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Washington, D.C. 20585

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